No. 120 January 2005

solplan review

the independent journal of energy conservation, building science & construction practice

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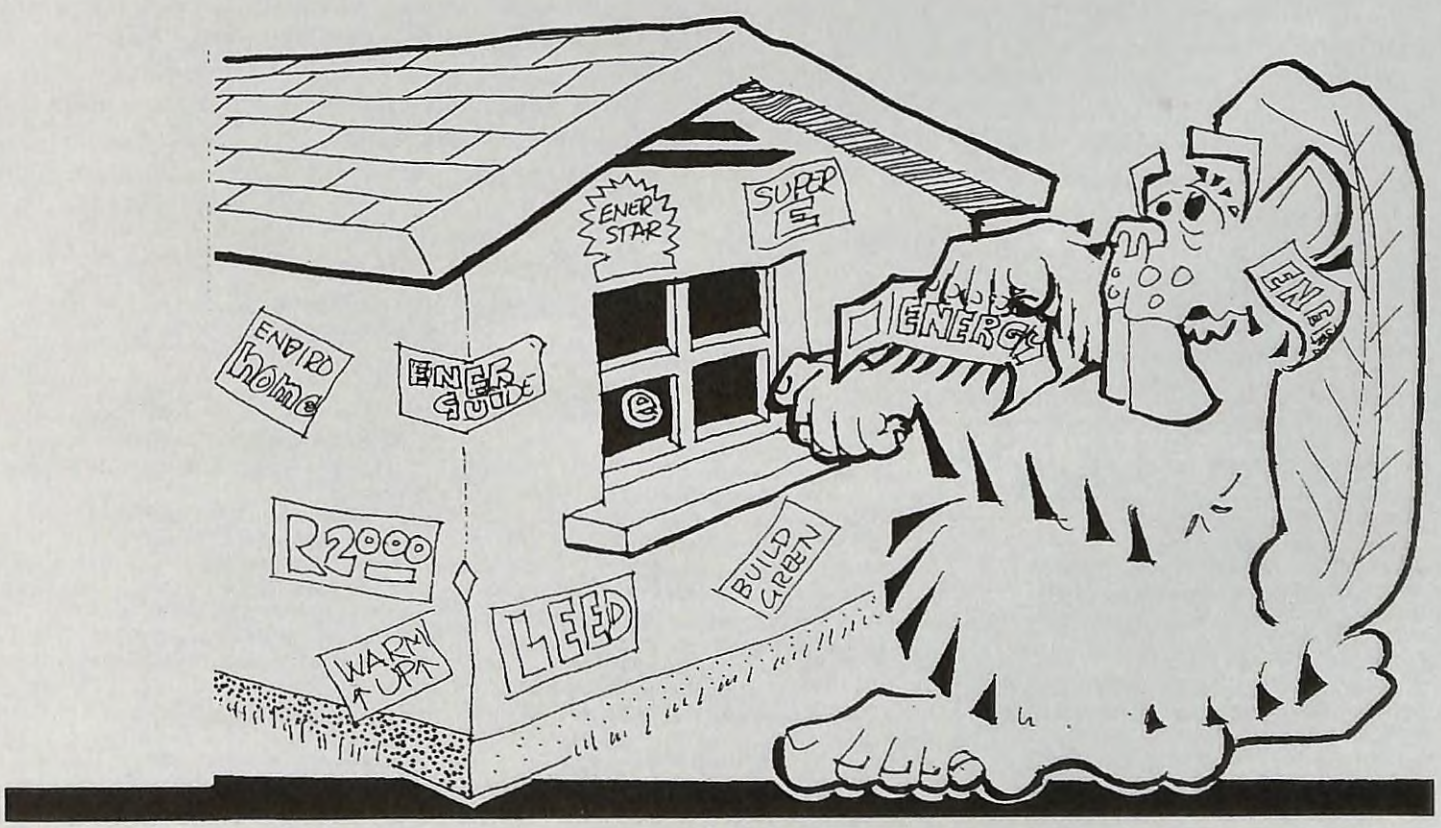
Home Labelling Programs



From the Editor . . .

The holiday season earthquake and tsunami in Southeast Asia came as a shock. It reminded us once again about the power of nature. And that there are forces in the world over which we are not masters.

It was heart-warming to see the response of Canadians and people around the world and their willingness to help victims in need. The outpouring overwhelmed aid agencies.

There is no doubt the people around the Indian Ocean who had their lives turned upside down need help. And many of them had little to start with.

This should give us cause to pause and reflect on our own situation. We in Canada are blessed to live in a benign land of plenty. Despite the occasional winter or summer storm or flood, we generally have few traumatic natural disasters of the kind we see on TV or read about in other parts of the globe. With our high standard of living, we also don't have the shantytowns and slums we see in other parts of the world – those transient, makeshift homes people put up in desperation for shelter, and which are vulnerable to the slightest external forces.

We don't often stop to consider that while we agonize over the colours for the wall, the extra bathroom, or perhaps the added insulation we should put into the house, people in other parts of the world are agonizing over whether or not they'll have a roof of any kind over their head.

In this context, it is heartening to see the response of individual Canadians to the victims of the tsunami. However, we must be honest with ourselves. The past decade has seen a significant increase in the homeless in this country too, not as a result of natural disasters, but because of human actions that created conditions where more and more individuals are finding themselves out on the street.

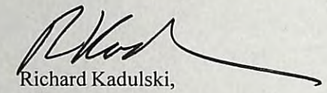
To our shame, we urban dwellers are becoming immune to the homeless sleeping on our streets. We're becoming so desensitized that we'll carefully step over a sleeping body on the street as if it was a normal thing to do. And the homeless are not just a big city issue – many smaller cities have the same problems.

We need to look at the non-disaster emergency conditions here at home as well as elsewhere in the world. While the focus was on Asia, here in Vancouver the thermometer dipped a few degrees below zero, at which point additional emergency shelters were supposed to be opened. It was shocking to hear the debate over whether it is minus three or minus four degrees (is that with or without wind-chill?) that is to be the trigger point for providing extra shelter. Presumably, the torrential rains that followed the cold spell don't count, so the homeless can find their own way again to sleep under bridges and in covered doorways.

Let's not forget the generosity of spirit exhibited to the poor unfortunate souls in Southeast Asia when we turn our gaze homeward again. We should see if we can make a real effort to deal with the problems of the homeless here too.

Housing and its affordability is not just an issue of a house in the suburbs for the family of mom and dad and 1.5 kids. The challenge goes well beyond looking for a tax break for a house. Just as we are realizing that there is a variety of alternate family groupings, there are also alternate forms of housing. We have a hard time accepting that not everyone can look after themselves. Some people who've lost their way for any number of reasons require more active support from the rest of us.

All great religions profess the need to look after not only our family but our neighbours too. We seem either not to have learned that lesson or else we've forgotten it too quickly.



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Editor

solplan review
the independent journal of energy conservation, building science & construction practice

Editor-Publisher: Richard Kadulski
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ISSN: 0828-6574
Date of Issue: February 2005
SOLPLAN REVIEW is published 6 times per year by:
the drawing-room graphic services ltd.
PO Box 86627, North Vancouver, BC V7L 4L2
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#204 - 1037 West Broadway
Vancouver, BC V6H 1E3

Publications Mail Agreement No. 40013363
Postage paid in Vancouver, BC.
Return undeliverable Canadian addresses to
PO Box 86627, North Vancouver, BC V7L 4L2
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Home Labelling Programs for Energy Efficiency

The number of energy efficiency housing programs in Canada is growing. The many programs and their features and requirements for participation are also causing confusion not only among builders but also among consumers.

Some of the programs focus on energy efficiency, others on green building principles or some combination of the two. A major criterion for some is to provide a label or certificate based on some measure of energy performance. We are presenting a summary description of the programs, from a report prepared by Linden Holmen for the Canadian Home Builders' Association.

R-2000

In 1980 the federal government introduced the Super Energy Efficient Home Program (SEEH) to stimulate construction of energy-efficient houses. This became the R-2000 Program, which was officially launched in 1982. The objective is to encourage the building of energy-efficient houses that are environmentally friendly and healthy to live in at a standard of energy efficiency exceeding that of conventionally built homes.

The R-2000 standard is managed by Natural Resources Canada (NRCan) in cooperation with the Canadian Home Builders' Association, regional delivery agents, the Heating, Refrigeration and Air Conditioning Institute (HRAI.), the Canadian Manufactured Housing Institute (CMHI) and other provincial government organizations. R-2000 is a voluntary certification program. A Certified R-2000 home is a home built by a licensed R-2000 builder that meets the R-2000 standard as determined by a successful completion of the R-2000 quality assurance process and that has been issued a certificate by NRCan.

The standard is supported by:

A series of tools, including HOT2000, an energy analysis software tool; quality assurance measures; and training for key players in the R-2000 standard. These include R-2000 builders and service providers.

Delivery agents include provincial home builder associations, utilities and private companies contracted to administer the program in each province.

Service providers include plan evaluators, airtightness testers and inspectors. They are an important source of technical information for builders.

Plan evaluators help the builder determine that the R-2000 house complies with the R-2000 technical requirements at the design stage. Using the HOT2000 software, they often consider options by which the builder can meet the energy target in a cost-effective way.

Quality assurance is achieved through on-site inspection of the house. Independent third party inspectors ensure that the house as-built conforms to the R-2000 standard, and the HOT2000 run and details submitted verify that the heating and ventilation system was designed and that someone has taken responsibility for the design, installation and performance testing.

The airtightness tester verifies that the house meets the tightness criteria and does a fan depressurization test when required.

Marketing support includes the development of national marketing strategies and promotional efforts to builders, consumers and others in the industry.

R-2000 Technical Requirements

R-2000 takes a system approach to the design and construction of houses, based on the understanding that a house is a collection of interrelated systems that determine how the whole building performs. R-2000 houses must meet all specified technical requirements to be certified as R-2000 houses. The R-2000 standard is basically a performance standard.

Energy use is reduced because the envelope systems in R-2000 houses are well insulated and incorporate higher levels of airtightness than are normally achieved in conventional housing. Windows must be high-performance units.

Heating and cooling systems must be high-efficiency and properly designed. Forced air heating systems that distribute ventilation must use high-efficiency blower motors to reduce electrical loads associated with conventional fan motors/blowers. Fuel-fired space and water-heating appliances must be sealed combustion systems and independently vented with electronic ignition. Natural gas and propane fireplaces must be sealed, direct vent units. Wood-burning appliances can be used, but they must be certified.

To ensure that the interior environment is healthy, and because of the stress on the airtightness of the building envelope, R-2000 houses must have balanced ventilation systems, and special attention must be given to the selection of interior finishes. In addition, to improve indoor air quality, selecting products that have no or limited emissions of noxious substances is encouraged. This is done through the R-2000 Indoor Air Quality Pick-List. Currently nine items are listed on this list: carpeting, air filtration, paints and varnishes, floor adhesives, kitchen cabinets and bathroom vanities, vinyl flooring, particle board underlayment, sub-slab depressurization, and specified moisture control strategies.

As well, at least two of 13 environmental features in the Environmental Features R-2000 Pick-List must be used. The intent is to use materials with high amounts of recycled content. The list includes four types of insulation products, two types of sheathing/drywall and three types of interior trim.

To reduce environmental impacts, reduced water use is promoted. Six-litre low-flow toilets are required.

To be a licensed R-2000 builder, a builder must successfully complete the R-2000 Builder Workshop and must build a certified R-2000 demonstration home within two years of completing the training. To keep current, builders must attend an R-2000 Builder Update workshop every three years, hold a valid R-2000 Licensing Agreement with NRCan, and build at least one certified home per year.

For information on the R-2000 Program, contact your local program office, or call 1-800-387-2000 www.R-2000.ca

EnviroHome

The EnviroHome program is a nation-wide marketing program to support the R-2000 program. Its objectives are to recognize and support innovative R-2000 home builders who are committed to offering consumers homes that are "better for you, better for your community and better for the environment." It produces average priced showcase homes and is not intended to produce high volumes of housing.

The EnviroHome initiative is sponsored by CHBA and TD Canada Trust with support from CMHC and NRCan, and each EnviroHome must be endorsed by a local home builder association.

Super-E Program

The Super-E program, based on the R-2000 program, is for export housing only. It is currently active in Japan, the UK and Ireland. Interest has been shown in other countries, including China where a demonstration project is under construction.

The Super-E program is adapted to local climatic conditions. The technical requirements have been developed on the basis of a system approach to the design and construction of buildings and include better building practices, such as requiring the use of rain screen wall detailing.

The Super-E program is intended to improve the volume, profitability and sustainability of Canadian housing and building product exporters in target export markets while providing economical, comfortable energy efficient and environmentally responsible housing to consumers in those target markets. Each Super-E house must have a minimum of 60% Canadian content.

Foreign company members partner with Canadian exporters. In order to become Super-E members, both Canadian and foreign companies must meet specified requirements including knowledge of R-2000.

NRCan developed and supports the Super-E program with the assistance of CMHC. International. Support to Canadian companies participating in the program includes training, technical information, market intelligence and marketing materials.

Novoclimat

Its objective is to encourage energy efficient and environmentally responsible new houses in Quebec. Its goal is housing that is at least 25% more energy efficient than code requirements, which in Quebec are based on the Model National Energy Code.

The Novoclimat standard has three versions and is based on the Model National Energy Code and some aspects of the R-2000 program. The success of the Novoclimat program is simplification of the administration process, largely because it is mainly a prescriptive standard supported by a very detailed technical guide.

The Novoclimat House (***Maison Novoclimat***) standard is a prescriptive standard that applies to single-family buildings (either attached or detached) with a maximum of four storeys including a basement.

Novoclimat R-2000.

This is essentially the R-2000 Standard with all R-2000 technical requirements.

The third standard is the Novoclimat Standard for Multiple Family Buildings (***Novoclimat Multifamiliale***) and applies to dwellings built under Part 9 of the 1995 NBC.

Inspections are done to ensure that the house as built conforms to the Novoclimat standards.

To be a Novoclimat builder, a builder must be licensed.

Maison Novoclimat Building envelope requirements	
Ceiling	R-42 (RSI 7.22)
Walls	R-25 (RSI 4.31)
Basement walls	R-18 (RSI 2.99) full height
Basement floors	R-5 (RSI 0.88) over entire floor R-7.6 (RSI 1.32) if along 4 foot perimeter only.
Wall between house & garage	R-20 (RSI 3.52)
Exposed floors	R-30 (RSI 5.20)
Building airtightness	2.0 ACH at 50 Pascals
NB: insulation values are efective, not nominal.	

EnerGuide for Houses

EnerGuide for Houses is a labelling program. It does not set energy efficiency targets, but rates the home's energy efficiency. House evaluations follow a specific procedure to assess energy consumption and ventilation requirements, airtightness testing and a depressurization test which will warn of potential combustion spillage problems. Energuide advisors perform on-site evaluations and recommend energy efficient improvements to the homeowner. The evaluation process is intended to encourage energy efficiency improvements while maintaining or improving a home's indoor environment and durability in order to reduce the impact of housing on the environment.

The EnerGuide for Houses (EGH) energy efficiency rating label provides homeowners with a rating that enables them to compare the efficiency of their home to others.

The EnerGuide for Houses program has two components: one for existing houses, and one for new houses.

The EnerGuide program was developed and is managed by the Office of Energy Efficiency (OEE) of Natural Resources Canada (NRCan) with support from CMHC. The delivery of the Energuide for Houses program is handled by

The EnerGuide for Houses (EGH) rating is measured on a scale of 0-100. The higher the number, the more energy efficient the house. Typical ratings	
0-50	Old house not upgraded
51-65	Upgraded old house
66-74	Energy efficient old house or typical new house
75-79	Energy efficient new house
80-90	Highly energy-efficient new house (minimum energy performance rating of an R-2000 house is 80).
91-100	House requiring little or no energy

service organizations contracted to NRCan. These organizations recruit energy advisors, administer their certification and guarantee the integrity and administration of the EGH service at the local or regional level for existing houses. NRCan performs quality assurance audits.

EnerGuide for New Houses

Energuide for New Houses is the labelling program for new homes. It helps builders offer verifiable performance. New home builders who participate in EGNH must offer new home buyers an EGNH evaluation for their company's new homes at the design stage, follow up with an as-built EGNH evaluation for homebuyers who purchase this service, and train their sales personnel in the marketing of energy upgrade packages by promoting the inclusion of energy upgrade packages in some or all of the homes they build.

New home builders who work with EGNH to offer energy upgrade packages to their clients are required to have a license agreement in place with NRCan.

Built Green Alberta

Launched in October 2003, Built Green is an initiative of the Calgary Regional Home Builders Association. It builds on both the EnerGuide for New Houses program (EGNH) and the R-2000 program. Built Green Alberta offers flexibility, allowing customers and builders to choose a wide range of "green" options.

Its objective is to encourage homebuilders to use technologies, products and practices that will provide greater energy efficiency and reduce pollution, provide healthier indoor air, reduce water usage, preserve natural resources, improve building durability, and reduce building maintenance.

Built Green is structured to require a minimum number of points in each of six categories:

- *Operational systems* (min 13 points out of a possible total of 92)
- *Building materials* (min 12 points out of 49)
- *Exterior and interior finishes* (min 10 points out of 92).
- *Indoor air quality* (min 12 points out of 61)
- *Waste management* (min 7 points out of 25)
- *Water conservation* (min 6 points out of 15)

Built Green Alberta has three levels:

✓***Bronze***: Requires an EGNH rating of 72 (which counts for 20 Points) plus 60 additional points for a total of 80 points.

✓***Silver***: Requires an EGNH rating of 75 (which counts for 25 points) plus 65 additional points for a total of 90 points.

✓***Gold***: Requires an EGNH rating of 77 (which counts for 30 points) plus an additional 70 points for a total of 100 points.

A training program is required for builders and renovators, the core of which is the R-2000 builder-training curriculum. Only certified Built Green Alberta builder members can build a Built Green Alberta home. To participate, builders pay an initiation fee of $500, which includes the two day Built Green Alberta training course and plan evaluation training. Builders pay $100 per certified house, which includes the cost of a blower door test.

LEED (Leadership in Energy and Environmental Design)

LEED is a US-based voluntary rating system for sustainable commercial, institutional and high-rise residential buildings built under Part 3 of the Building Code. It was developed by the US Green Building Council. It defines green building by establishing a common standard of measurement for North American projects, and promotes integrated, whole building design practises. Although several other rating systems for this building sector exist, LEED is quickly emerging as the dominant green building standard.

LEED certification recognizes environmental leadership in the building industry and raises consumer awareness of green building products. Ultimately, the goal is to transform the building market. A Canadian version of the LEED standard has been developed by the Canadian Green Building Council LEED.

The LEED building rating system consists of an explicit set of ecological health and internal environment performance criteria for buildings in five categories: sustainable sites; water efficiency; energy and atmosphere; materials and resources; and indoor environmental quality.

A LEED houses standard is now being developed. What form it will take, nor how it will relate to R-2000 and EGNH is not entirely clear as yet.

Energy Star

The Energy Star program originated in the United States. Energy Star is a US government-backed program to promote energy efficiency in buildings and various products.

Canada is one of several countries that have adopted the Energy Star program for some products. These include appliances, office equipment, windows, sliding glass doors, and heating and cooling equipment. In Canada, product standards are similar to those set by the US EPA, but some have been modified by NRCan to reflect distinct Canadian requirements. For example, Canadian Energy Star ratings for windows are more stringent than those in the US, to reflect the harsher climate conditions in many parts of Canada.

In the US, Energy Star can also be applied to detached houses and multi-unit building up to three storeys. Energy Star new homes are meant to be at least 30% more energy efficient than homes built to the 1993 US National Model Energy Code or 15% more energy efficient than state energy codes, whichever is more rigorous. If a Home Energy Rating System (HERS) is used, the house must achieve a rating of 86.

The US HERS ratings are not the same as Canadian EnerGuide ratings. An R-2000 house exceeds the Energy Star requirements (an R-2000 home would rate between 89 and 91 on the US HERS scale, while on the Energuide for houses scale it would be a minimum of 80).

A pilot project of a Canadian version of an Energy Star home has been launched in Ontario.

Power Smart

Power Smart is a broad energy conservation initiative developed by BC Hydro ten years ago. It applies to the residential, commercial, institutional and industrial sectors, and has as its objective reducing electrical energy use by encouraging the adoption of cost-effective, energy efficient measures.

In BC, the Power Smart New Homes program offers rebates for specified types of lighting, heating systems, appliances, windows and ventilation.

Rebates of $1,000 for certified R-2000 houses with electric space heating are available for houses built in an area where natural gas is not an option.

Manitoba Power Smart Program

The Power Smart program in Manitoba has taken lead from BC Hydro, focusing on energy efficiency improvements rather than new sources of generation.

The Manitoba Power Smart New Home program is an incentive program targeted at new homes to encourage the construction of energy efficient new houses. It has prescriptive minimum technical standards. Each house must be analyzed under the EnerGuide for New Houses program. Each completed house will be inspected by Manitoba Hydro to ensure compliance with the Power Smart standards. The inspection includes an airtightness test (1.5 air changes at 50 Pascals to meet Power Smart standards).☼

Summaries of Energy Efficient Housing Programs in Canada
prepared for Canadian Home Builders' Association by Linden Holmen

Kyoto Protocol to Come Into Force February 16, 2005

On November 18, 2004, the United Nations confirmed the ratification of the Kyoto Protocol. The ratification by Russia meets the global commitment for the Protocol to come into force and become legally binding on February 16, 2005.

The Protocol's coming into force will mean that thirty industrialized countries, including Canada, will be required to meet their targets for reducing greenhouse gas emissions between 2008 and 2012, international carbon trading will begin and the Clean Development Mechanism and Adaptation Fund for developing countries will move forward.

Only four industrialized countries have not ratified the Kyoto Protocol: Australia, Liechtenstein, Monaco and the United States.☼

High Performance Houses

Canadians have been pioneers in energy efficient house construction. Building on the work of the National Research Council's Prairie Station, the Saskatchewan Conservation House was built in Regina in the 1970s. The Saskatchewan Conservation House was a landmark that received worldwide attention. It showed that it is possible to build extremely energy efficient houses.

The early demonstration projects were powerful tools that showed builders how energy efficient homes can be built. We learned a lot from those early demonstration projects. They encouraged many pioneering builders and designers to improve the performance of the homes they were designing and building. They also led to the development of the R-2000 program which was designed to show builders how they can apply high performance standards to market housing.

From the beginning, an important part of the work was in giving recognition to the fact that a house is a system; it must be considered as a whole and not as a series of separate components put together. The Conservation House recognized that when you air seal the house as part of the energy efficiency upgrades, you also need to provide effective and continuous ventilation. That is why the house had an early prototype heat recovery ventilator.

The performance standards for the R-2000 house have been set to be economically achievable, even in the context of production market housing. But is that enough?

Contrary to the belief of many in the industry, even though Canadian homes have become more energy efficient than ever, the average new home is still a long way from meeting the energy performance of an R-2000 house. The average new home built today still consumes 30 - 40% more energy than a new home meeting the R-2000 standard. Perhaps the R-2000 standard merits review to see if it could be more rigorous. We know that it is possible to build much more energy efficient homes.

The strengths of the Canadian R-2000 standard and its approach have been recognized around the world. We've set the lead. It has been copied and adapted by other jurisdictions. It is interesting to see what others in the world are now doing, and how they are meeting the challenges of reducing energy use and environmental impact.

Europeans are aggressively reviewing their construction standards. Their underlying premise is not to look at the short term economic payback for the individual, which is the basis of most of our energy standards, but rather to look at the broader overall societal costs of energy use.

Proposed changes to the energy standards in the UK are based on the fact that the UK government has acknowledged that global warming is a reality. As part of the international effort to control climate change, they have set a goal of putting the UK on a path to cutting its carbon dioxide emissions – the main contributor to global warming – by some 60% by around 2050, with real progress by 2020.

About a half of all the UK's CO_2 emissions come from buildings: about 30% from the 24 million dwellings in the UK.

Significant improvements to the energy efficiency provisions of their building regulations are seen as a major contributor toward achieving the target of a 20% reduction in carbon emissions by 2010. If implemented, it will mean an improvement in the energy efficiency of new buildings of around 25%. Key features in the proposals include setting performance standards for buildings as a whole, and to move toward airtightness testing of all dwellings. Improvements on a lesser scale would also be obtained whenever people carry out work on existing buildings, as the standard would also apply to renovation work.

The proposed UK standard is seen as the first step in a series of improvements to be introduced over the next fifteen years. It is intended for the standards to be reviewed every five years and tightened up.

We've summarized their ambitious proposals in the table. It may take a while for full implementation to become the norm and the building

	Proposed 2005 UK standard	**Proposed 2010 UK standard**	**R-2000** *(minimum)*	*R-2000 values in Canada vary on climate conditions., but are not less than local energy code requirements. Noted values are typical for West coast R-2000 houses, which are in a climate zone that is similar to many parts of the UK*
Walls	R-21	R-28	R-20 +	Current standards in other European countries: Ireland R-28 Switzerland R-21 Denmark R-20 to R-28
Ceiling	R-44	R-57	Vaulted R-28; flat R-40 +	Current standards in other European countries: Ireland R-36 Switzerland R-28 Denmark R-28 to R-38
Exposed Floor	R-26	R-28	R-28	Current standards in other European countries: Ireland R-22 Switzerland R-28 Denmark R-28
Windows	R-3.17	R-4	R-3.17	Current standards in other European countries: Ireland R-2.6 Switzerland R-4.75 Denmark R-3.17
Airtightness	7 -10 ach@50 Pa	3.5 ach@50 Pa	1.5 ach@50 Pa	Current standards in other European countries: Netherlands 6 ach @ 50 Pa Germany 1.8 to 3.6 ach @ 50 Pa Switzerland 3.6 ach @ 50 Pa
Boilers	86%	low or zero carbon systems (e.g. heat pumps, solar DHW, etc.)	82%	
Values are approximate conversions. In all cases, the requirements are for effective (not nominal) values, for the assembly so that the impact of thermal bridging is considered. European practice is not to build basements, so typically the exposed floor is the floor assembly over an unheated crawlspace.				

industry to become comfortable with the new standards. It may take a while before UK builders are able to actually do the job. However, the commitment has been made. They also tell us that Canada is not going to be that far ahead once the new UK standards have been implemented. As can be seen in the table, the UK proposals are not unique, but are in line with other European countries who are also in the process of reviewing their standards.

As Europeans work out implementation problems, one can see that their homes will be more energy efficient than even R-2000 homes unless we review our standards.

The point of all this is not for bragging rights as to who has the most energy efficient homes. Rather, it is addressing a real and serious issue we need to deal with today. That is the need to reduce emissions of greenhouse gases that are changing the climate in ways we do not know. It is also necessary to deal with the fact that non-renewable fossil fuel production is past its peak worldwide. These fuels will become scarcer and more expensive in the future – definitely within lifespan of the homes we build today.

We should be striving to build homes that can do without a furnace. After all, the houses we build today will still be in use at a time when energy prices skyrocket as fossil fuels are depleted for good. ☼

Energy Efficient Gas Furnaces

In some parts of the country, high efficiency condensing gas furnaces are widely used. In others, they are still custom installations or used mostly in retrofits.

Because the blowers today are more likely to be operated continuously as part of a ventilation/ and or filtration strategy, the power consumed by the fan motor is important. To put it simply, older technology motors are not energy efficient. The premium for the better blower motor usually pays itself off within a year or so due to the savings in electricity consumption. Unfortunately, not all high efficiency furnaces come with the high efficiency blower motors, although most furnace manufacturers have models with the better motors.

As of this year, the R-2000 program requires forced warm air furnaces that also are part of the ventilation system to have high efficiency variable speed or ECM motors.

We've listed a selection of high efficiency furnaces that have high efficiency blower motors as part of the unit in the accompanying table.

For R-2000 builders, NRCan is offering a $200 rebate for each home with a furnace or ventilation system equipped with an energy efficient motor certified before October, 2005. Check with your regional program manager for details.

The full list is available at the Energy Star section of the NRCan web site:

http://oee.nrcan.gc.ca/energystar/english/consumers/products.cfm

It does take a bit of digging to find. Follow the links for heating, cooling & ventilation equipment. Deep on the page there is link to "gas fired furnaces". The direct link is:

http://oee.nrcan.gc.ca/energystar/english/consumers/gasfired_furnaces.cfm?text=N&printview=N

Manufacturer	Models	Heat Capacity *(BTU/hr)*	AFUE (%)
Bryant	355MAV042040	38000	96.6
Carrier	58MVP040-14	38,000 25,000	96.6
Weathermaker	58MVP040 58MVP040-14-L	38,000 25,000	96.6
Armstrong Johnson Air-Ease	G2D95AC040V12B G2D95AC060V14B G2D95AC080V16C G2D95AC100V20D G2D95AC125V20D	38,000 57,000 76,000 95,000 118,000	95
Dave Lennox SIGNATURE	G61MPV-60D-135-* G61MPV-60C-090-* G61MPV-36C-090-* G61MPV-60C-110-* G31V5-125-* G61MPV-36B-045 G61MPV-36B-070-*	122,000 82,000 79,000 99,000 118,000 39,000 61,000	94.6 94.6 94.3 94.3 94.2 94.1 94.1
Rheem	RGFD-09*ZCMS**	85000	94.1
Ruud	UGFD-09*ZCMS**	85000	94.1
Bryant	355MAV042060 355MAV042080 355MAV060100 355MAV060120	56,000 74,000 93,000 111,000	94
Carrier	58MVP060-14-L 58MVP060-14 58MVP080-14 58MVP100-20 58MVP120-20	37,000 56,000 61,000 74,000 93,000 111,000	94
Coleman Coleman-Evcon Fraser-Johnston	G9V06012UPB11 G9V10020UPC11 G9V12020UPD11	57,000 95,000 112,000	94
Luxaire	FL9V040A12UP11 FL9V060B12DH11 FL9V080B12DH11 FL9V100C20DH11 FL9V120D20DH11	37,000 56,000 75,000 94,000 112,000	94
Weathermaker	58MVP060-14-L 58MVP080-14-L 58MVP060-14 58MVP100-20-L 58MVP080-14 58MVP100-20	37,000 49,000 57,000 61,000 76,000 95,000	94
York	P1XUB12V05501 P1XUC20N09501 P1XUD20N11201	57,000 95,000 112,000	94
American Standard	AUY060R9V3W* AUY100R9V4W*	56,000 93,000	93.6
Trane	TUY060R9V3W* TUY100R9V4W*	56,000 93,000	93

Technical Research Committee News

Update to the National Building Code

Following the comments received during last year's review period by the standing committees, the Canadian Codes Centre has approved the final form of the 2005 National Building Code. The target date for release is September 2005. At that time, the code will be available on both CD and in hard copy.

Users will need the CD version in order to take full advantage of all the features of the objective-based code's new format. However, Part B of the code will be the updated version of the present code book, which most users will probably rely on.

Because all provinces have been working together on the code review, adoption of the new code in each province should happen quickly after the release of the NBC.

Fire Sprinklers in Ontario

A private member's bill has passed second reading in the Ontario legislature to mandate the use of fire sprinklers in all new residential construction in the province. Ontario homebuilders are talking to legislators to impress upon them the impact sprinklers will have on housing costs. New construction standards are much higher and practices call for more fire resistance, making the choice of sprinklers less cost-effective than other options.

Most tragic fires that trigger a move to mandate sprinklers happen in older buildings that do not meet current construction standards. Many of these buildings may not be well maintained.

Changes to the Electrical Code

Changes coming to the Ontario Electrical Code will require electrical receptacles in kitchen islands, regardless of size, and in peninsulas. In addition, a ground-fault circuit interrupter (GFCI) will be required for any outlet within 1.5 metres of any sink or dishwasher.

Toilet Effectiveness

With the increased interest in reducing water consumption, local authorities are encouraging the use of ultra-low-flow toilets. However, anecdotal experience has led some plumbers to discourage the use of these products. In addition, previous studies have shown that not all 6-litre toilets are effective.

That is why the City of Toronto, CMHC, and industry have been testing the effectiveness of 6-litre toilets. The project team has developed a new test protocol that includes a more realistic testing medium than has been the case with past testing practices. The test uses materials that more closely match biologically the exact texture and density of waste materials.

What has been found is that a 6-litre toilet will adequately move wastes 60 to 90 feet down a sewer pipe it when is sloped 2%. If the slope is less than 2%, or the flush water quantity is less, there is a significant reduction in the carrying capacity of the flush water and there is the risk of sedimentation and solids building up in the pipe.

This may explain why some plumbers and homeowners may have questioned the effectiveness of low-flow toilets, especially in retrofit applications where the sewer pipe slope may be less than the minimum 2% because of faulty pipe installation or because building settlement has modified the pipe slopes.

Canadian Home Builders' Association

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector.

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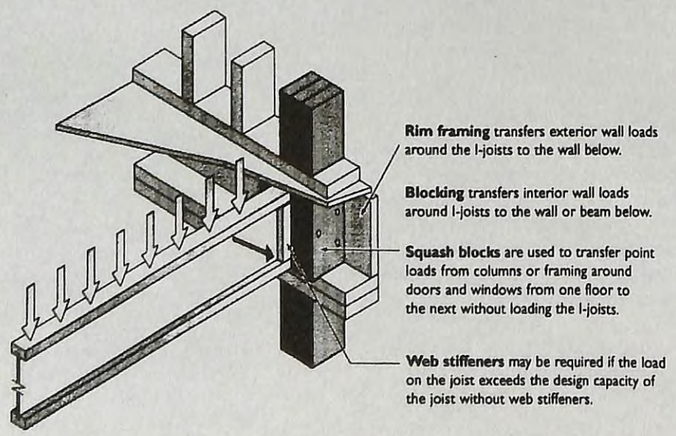
Installation Guide for Residential Wood I-Joist Floor Systems

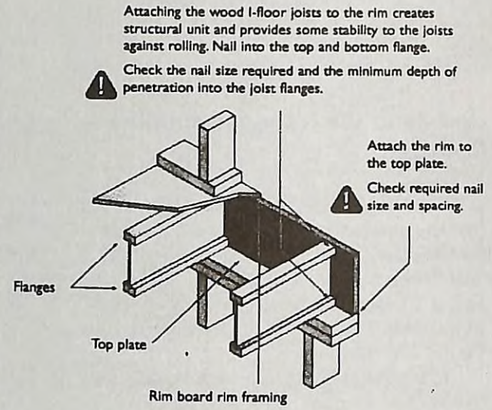
Wood I-joists have become common materials for framing residential floors. While these products have been available for many years, they are new to some builders. Canada Mortgage and Housing Corporation, with the support of the Canadian Home Builders' Association, commissioned the development of a Guide to help builders use wood I-joists safely and effectively.

The Guide presents information that is common to all wood I-joist manufacturers. It is intended to help builders understand the basics and to supplement the excellent technical literature and expertise provided by I-joist manufacturers.

Wood I-joists have long span and high load capacity relative to standard dimension lumber, but they are proprietary products. This means the design values are not standard, and the capabilities of I-joists (spans, loads, etc) and some installation details (nailing patterns, etc) may vary from manufacturer to manufacturer. It is important for builders to understand the basic principles for good I-joist installation, and to always consult the makers for manufacturer-specific requirements.

Builders using wood I-joists for the first time need to learn the framing techniques and principles that are unique to I-joists. Good installation


Rim framing transfers exterior wall loads around the I-joists to the wall below.
Blocking transfers interior wall loads around I-joists to the wall or beam below.
Squash blocks are used to transfer point loads from columns or framing around doors and windows from one floor to the next without loading the I-joists.
Web stiffeners may be required if the load on the joist exceeds the design capacity of the joist without web stiffeners.


Attaching the wood I-floor joists to the rim creates structural unit and provides some stability to the joists against rolling. Nail into the top and bottom flange.
Check the nail size required and the minimum depth of penetration into the joist flanges.
Attach the rim to the top plate.
Check required nail size and spacing.
Flanges
Top plate
Rim board rim framing

of wood I-joist flooring systems comes down to several straightforward areas that require understanding and implementation. The Guide calls these the Basics for Good Wood I-joist Installations.

Storage and Handling

Wood I-joists are engineered products manufactured under controlled factory conditions. These high quality building materials should be stored and handled carefully.

Installation

Wood I-joists will not support workers or other loads until the joists are properly fastened and braced. No loads other than the weight of the workers should be placed on the joists until sheathing is permanently installed.

Span Charts

The bearing capacity of wood I-joists varies by manufacturer. It is important to consult the manufacturer's span charts.

Holes in Wood I- Joists

Wood I-joists are structural members designed to transfer floor loads to the joist supports. Field modifications to the webs or flanges can have a serious affect on the joists' capacity to perform. For this reason, the cutting, notching or relocation of framing members, especially by sub-contractors that may not be aware of the structural consequences of unauthorized modifications, must be done with extreme care and only in accordance with manufacturers' recommendations.

Bearing Length

The size of the loads carried by I-joists can be considerable. All the weight is transferred from the floor to the bearing walls via the point of contact between the lower I-joist flange and the bearing plate. The usual minimum joist end bearing for wood I-joists is 45 mm (1-¾"), but some manufacturers permit slightly less.

Offset Walls

Offsets dramatically increase shear loads in the web. There is no general direction for how to handle offsets. An offset of any size requires technical assistance from the manufacturer or from a structural engineer.

Rim Joist Framing

In wood I-joists systems, rim joist framing not only encloses the floor around the perimeter, but also transfers bearing wall loads to the wall below instead of into the ends of the joists.

Blocking

Two types of blocking are used for load transfer:

1. Squash blocks are used to transfer loads around I-joists for continuous bearing wall loads. Squash blocks are installed to transfer point loads from posts and columns around, rather than through, I-joists.

2. Blocking is used between joists. It is required at interior supports where there is a load-bearing wall and where floor joists are not continuous over supports, even if there is no load-bearing wall above.

Web Stiffeners

Web stiffeners are reinforcements attached to either side of a wood I-joist web over end supports or under a concentrated load.☼

Installation Guide for Residential Wood I-Joist Floor Systems *prepared for CMHC by J F Burrows and Accurate Design and Communications Inc.*

Lessons From Other Lands

It is human nature to try and hide embarrassing results. This is often the case when high profile demonstration or innovative projects don't meet expectations. Rather than learning from mistakes, errors in assumptions, false expectations or unrealistic goals, the project fades into memory with little being said.

Often, those immediately involved with the project will learn valuable lessons, but the information remains within a relatively narrow group of individuals. In the meantime, the information distributed because of the profile the project received is accepted by others as a model. Any errors in the assumptions or expected outcomes will be unknown for a long time, perhaps to be repeated by others. That is why an item in the newsletter of the Swedish building research organization caught our attention.

In 2001, an international housing exhibition was held in Malmö, Sweden. The "City of Tomorrow" was a high-profile demonstration of sustainable development. Its aim was to debate all aspects of urban development, how we live today and how we'll live in the future. Called ***Bo01: City of Tomorrow***, it showed provocatively imaginative visions of future living, where aesthetics, environment and high technology were combined to make a human-centred community.

The underlying premise was the recognition that, if we are to be successful at making the city more sustainable, life in it must be at least as convenient, economical, comfortable, pleasant, exciting and beautiful as today's non-sustainable cities. The speedy conversion of society to long-term sustainability will only happen when the sustainable alternative is seen to be the more attractive one.

The residential area was a newly-built, permanent urban district with mixed-use buildings and about 500 housing units which was located in a former industrial waterfront area of Malmö and within walking distance of the city centre.

It seems that, after a couple of years of occupancy, the energy consumption is higher than expected. None of the buildings has achieved the predicted energy performance, and occupants complain of uncomfortable environments. A follow-up research project is underway by the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning, to find out why performance is not up to what was anticipated. The Council intends to provide feedback to the planning and development community.☼

You Asked Us About:

Basement Floor Insulation

My client wants to make full use of the basement, and without installing a radiant floor heating system we would like to ensure that the basement floor stays as warm as possible.

The owner also wants the area to have carpet on the floor. Should the carpet be placed directly on the concrete floor or, if necessary, put down some sort of sub-floor on top of the concrete? Would that be a waste of money? We have lots of head-room in the basement, so if it were needed it would not be a problem to raise the floor. Can you offer any suggestions of how to build the basement floor?

If the basement is going to be used as finished space, then it needs to be properly insulated. I assume the walls will be well insulated and that ground water moisture issues have been dealt with. I would definitely insulate under the full floor area – use no less than 2-½ inches of extruded polystyrene (R-12). If the house is in a location with damp soils, it may be appropriate to increase the insulation level. (In some parts of Europe, slab-on-grade floors are insulated to a level of R-28 or more.)

I would suggest that first there be a 6-inch drain rock layer (any type that has few fines – you don't want sand under there); then a minimum of 6 mil poly, carefully lapped and sealed if needed, and then install the rigid insulation 2-½ or 3 inches of extruded polystyrene. You could also use high-density expanded polystyrene (bead board) but it would have to be thicker, as it has a lower R-value per inch thickness. The foam insulation should be snugly fit and the concrete slab poured right on top. Since the basement is being heated with forced air heating, it would be advisable to have the registers in the walls near the floor level. This should give you a warm basement once it is finished.

I would also strongly urge that a hard surface flooring be considered as the prime flooring (linoleum, laminate, tile, stamped/finished concrete). Where the owner wants to use carpets, they should be scatter area rugs that can be removed for cleaning.

The issue is that no matter how well insulated the slab is, especially because it is not a heated floor, the concrete will be cooler. As well, concrete has a (relatively) high moisture content – it is never completely dry, so that a carpet on top of the concrete acts as an insulating blanket, lowering the temperature of the surface of the concrete, so it is possible that it will be at or close to the dew point at some times of the year. In the hot humid summers on Southern Ontario, you can expect to encounter condensation on cool surfaces from time to time.

Condensation means the potential for mould growth, as there is a great deal of organic material on the floor (dust tracked in, skin we shed, fabric fibres, animal dander, etc.) that settles into the carpet can never be completely cleaned out, no matter how much vacuuming is done. Since it seems that you are planning to entirely finish the basement, you should also ensure that the home's ventilation system is also fully distributed in the basement area.☼

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Affordable Comfort Conference
May 16 – 21, 2005 Indianapolis, IN

Affordable Comfort has emerged as the premier American venue promoting residential building performance, energy efficiency, comfort, health, and safety in home retrofit, new construction, and renovation. It has set its mission to advance the performance of residential buildings through unbiased home performance education. The annual conference has grown to more than 1,500 participants because of its strong technical agenda. For those who've had the opportunity to attend the Ontario Builder Forum, it is that multiplied many times.

One of the strengths of Affordable Comfort is the extensive planning that goes into its development. Speakers and their presentations are carefully screened to ensure that presentations are going to be of benefit to those attending. The focus is practical information that the person in the field can use, and not either an academic presentation or a manufacturer's sales pitch. This is an educational event for the industry as much as a show-and-tell session. It is not an academic conference.

The two-and-a-half day conference features almost one hundred workshops in eighteen tracks as well as a two-day trade show showcasing cutting-edge products, diagnostic tools, software, training, and program implementation support.

In addition to the conference, there are half day and full day practical in-depth sessions focussing on a single topic on the days before and after the core conference. Some are hands-on sessions, so depending on the topic, attendance is limited.

If time and resources are limited, Affordabie Comfort is probably the one conference to attend. While it is an American organization, there is no shortage of Canadian involvement, as our research and expertise is valued. The current chairman of the organization is Skip Hayden, Head of the Residential/Commercial Combustion Advanced Combustion Technology Laboratory at NRCan in Ottawa.

Check out the conference brochure on its website.

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New Minimum Efficiency Ratings for Air Filters

Filter ratings have been based on four different test methods, with the result than any filter could be made to look good. To appreciate any significance, you had to understand the nuances of the different rating systems. Few people other than researchers and those in the filter industry fully understood them. What does Arizona road dust mean? How big or how small are those particles? Yet one of the most commonly-used filter tests relied on dust collected in Arizona.

Because of increased interest in air filtration, and the more widespread use of filters, ASHRAE has redefined the standard by which filters are tested and rated. Filters are now to be tested by the ASHRAE 52.2 standard.

The Minimum Efficiency Reporting Value or MERV is an improvement over the previous "dust-spot efficiencies" due to the type of test dust used and the way the test is performed. The new testing protocol generates more reliable and consistent filter performance measurements due to the regular use of more consistent test dust and a six-stage test process.

As the name MERV implies, this is the lowest level of performance provided by the filter during its useful life and indicates the filter's ability to trap particles ranging from 3.0 to 10.0 microns in diameter. This is a critical particle size, as these small particles largely stay airborne and are inhaled.

Residential filters are typically rated in the range of MERV 1-12, while for commercial filters the MERV ratings are in the range of 8-20. Commercial filters include deep-pleated bag filters, high-efficiency particulate air filters (HEPA) and ultra-low penetration air filters (UPPA).☼

MERV ratings for common filters	
Flat disposable fibreglass or polyester	0-1
Pleated disposable cotton polyester	3-6
Electrostatic Pleated	8-10
Deep Pleated microglass	8-10
HEPA filters	13 and higher
ULPA filters	15 and higher

Energy Answers

Rob Dumont

What are some relatively inexpensive ways to increase the insulation values of walls?

As I write this column on January 14, 2005, the wind chill temperature outdoors in Saskatoon as I came to work was -51 °C (-59.8 °F); the air temperature is -37 °C. Insulation is a great thing!

A key factor in assessing the overall insulation factor for walls is to take account of the heat loss through all parts of the wall, not just through the insulation.

For instance, a 2 x 4 wall with wood studs at 16 inches on centre with R11 insulation batts does not have an overall R-value of R11. If we take into account the effect of the studs and wall plates, the wall insulation value falls to R 10.6.

Steel studs are considerably worse than wood studs. A steel stud wall with R12 batts and studs at 16 inches on centre only has an R-value of about R7.

The Oak Ridge National Laboratory of the U.S. has published a useful paper on the subject. It is available at:

www.ornl.gov/sci/roofs+walls/articles/wallratings/index.html

Here are several ways to improve the R-values of walls in new construction relatively inexpensively. A lot of this information is quite old, but it is amazing how little of it is being applied in the field.

1. Increase the wall stud spacing from 16 inches on centre to 24 inches on centre.

On a 2 x 4 wall system, the R-value is increased from R12 to about R12.9, for a gain of 7.5 % in R-value. On a 2 x 6 wall, the R-value will increase from R17.7 to R 19.5. In addition, the wall will be less expensive to build.

2. Increase the R-value of the insulation used.

It is now possible to buy higher density R14 batts that will fit in 2 x 4 wall cavities. With the R14 batts and 24-inch on-centre studs, the R-value of the wall increases to R14.2, or 18% better than the base wall R value of R12. The extra cost of the R 14 batts compared with R12 batts is about 7%. For 6-inch studs, R 22 batts are now available.

3. Replace the wall sheathing (which is often oriented strand board or plywood) with insulating foam sheathing.

The least expensive foam is usually beadboard (expanded polystyrene) with an R-value of about 3.7 per inch of thickness; the next most expensive is extruded polystyrene (R5 per inch), and the most expensive is foil faced polyurethane board (about R6 per inch). To provide racking strength for the wall, metal cross bracing will be needed. One slight disadvantage of the foam sheathing is that the wall will have less mass than the wall with OSB or plywood sheathing, and more noise transmission from outside will occur.

4. Increase the stud size.

Going from 2 x 4 to 2 x 6 studs obviously increases the cost, but the cost increase can be relatively small if some simple value engineering techniques are used. With a 2 x 6 stud, you can cantilever the bottom plate of the wall over the foundation by about 2 inches. Aligning the floor joists, the wall studs and the trusses will allow you to go to a single top plate for the walls, again saving on materials and labour. A 2 x 6 stud wall with studs at 24 inches on centre and R22 high-density batts will have an R-value of 20.8.

5. Use 2 x 3 horizontal strapping on the inside of the wall studs.

The strapping can be placed at 24 inches on centre and R8 batts used between the strapping.

To get wall R-values larger than about R 27, double stud walls have been used.

In my own house, we have R60 wall insulation, which was accomplished by using two 2 x 4 stud walls in parallel with a 9-inch air space between the two walls.. The insulation used was blown cellulose.

Summary Table

R-values for typical wood frame walls, taking into account the effect of the stud and plate conduction, which effectively reduce the insulation values because the wood members are poorer insulators than the insulation are presented in the table.

The assumption is that the wall system uses half-inch gypsum board on the interior, batt insulation between the studs, 7/16-inch-thick oriented strand board sheathing, building paper, and aluminum or vinyl siding exterior finish. The values are mostly taken from the Canada's 1997 Model National Code for Buildings, which has a fairly comprehensive listing of R-values for common construction assemblies. Enermodal Engineering of Waterloo Ontario did the detailed computer modelling of the performance of these wall assemblies.☼

	Thermal Resistance hr-ft²-°F/BTU
2 x 4 @ 16 inches on center regular R12 batt insulation	12.0
2 x 4 @ 24inches on center regular R12 batt insulation	12.9
2 x4 @24 inches on center, R14 batt insulation	14.9
2 x 6 @ 16 inches on center Regular batt insulation	17.7
2 x 6 @ 24 inches on center Regular batt insulation	19.5
2 x 6 @ 24 inches on center, R22 batts	20.8
2 x 6 @ 24 inches on center, R20 batts, R6 rigid polystyrene insulation sheathing	25.3
2 x 6 @ 24 inches on center, R 20 batts, R7.5 rigid polystyrene insulation sheathing	27.0
2 x 6 @ 24 inches on center, R22 batts, 2 x 3 horizontal strapping at 24 inches on center	27.8
Conversion Factors: A metric R value of 1 m² °C/Watt is equal to a value of 5.67 h-ft²-°F/BTU in English units. 1 inch = 25.4 mm	

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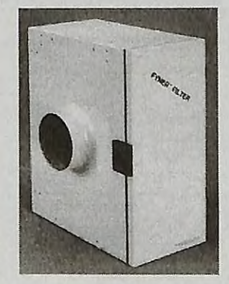

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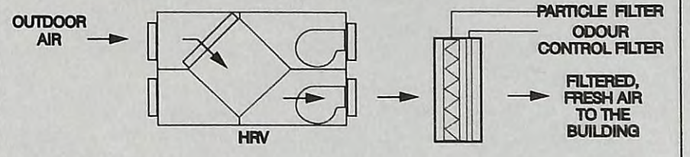

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Mould in Buildings: A Workshop Report Now Available

Over the past few years, mould in buildings has become a major concern for building occupants, health officials and building designers and builders. There have been many media reports about mould contamination in the indoor environment and alleged links to increased asthma, allergies and other ailments. But much of the evidence offered in these accounts has been anecdotal and/or based on information of varying quality.

To examine the mould issue from a Canadian and a scientific perspective, the National Research Council's Institute for Research in Construction (IRC), with its partners in the Healthy Indoors Partnership (HIP), organized a workshop involving experts from fields such as health, construction, occupational health and safety, microbiology and property management. The purpose of the workshop was to examine the economic, health and environmental issues associated with indoor mould contamination. It focused on two main areas – the health effects of mould, and mould prevention and control – to identify the major issues, information gaps and challenges, and to suggest areas for improvement and coordination. By this sharing of wide-ranging knowledge, the participants felt they could better understand stakeholders' needs and make informed decisions about research priorities.

The presenters at the workshop addressed the mould issues from the following perspectives:

First Nations
Public Works
Municipalities
Clinical
Epidemiology
Building Products
Occupational Health and Safety
Major Issues and Knowledge Gaps
Scientific Findings
Building Products and Building Envelope
Ventilation and Air Conditioning
Provincial Public Health
Research Priorities
Climate
Remedial Techniques and Diagnostic Tools

The presentations and reports have been completed by the HIP Strategic Research Committee and can be viewed in their entirety at *http://www.healthyindoors.com*

For both health effects and prevention and control, the participants identified the abundance of often unreliable information as a source of problems. For health effects specifically, they also identified problems with the lack of standardized guidelines for investigation, clinical assessment, environmental sampling and laboratory testing; the lack of an accreditation system for practitioners at all levels; and the lack of clinical and fundamental knowledge about mould-related symptoms among health practitioners.

For mould prevention and control, the participants found the lack of standards equally problematic. In particular, they identified the need for recognized threshold levels for safe exposure to mould; and the need for standards, guidelines and best practices related to building construction and operation, building renovation and retrofit, and mould detection and remediation.

The presentation on building materials and envelopes noted that the control of mould is directly linked to controlling moisture. It recommended strict attention to the design and construction of building envelopes that deflect moisture, provide drainage paths for moisture that does enter the envelope and allow cavities to dry, and measures to control drafts into enclosed spaces. It concluded that the building technology exists for controlling moisture and mould in new construction, but the proper techniques are not always applied. Regardless, some participants expressed a need for regulations, standards, and good practices for controlling mould.

While good design and construction can control mould for usual circumstances, flooding due to extreme weather or infrastructure malfunction provides an additional challenge. Restoration work that follows needs direction (qualification, methods, and testing) to ensure it does not lead to later mould problems. Testing and sampling methods and protocols are needed to quantify and identify mould.

Municipalities operate many types of facilities that provide services to the public, including multi-use facilities like pools / rinks that pose particular challenges for managing moisture. From the municipal perspectives, the following observations were offered:

- Mould exists in all facilities to some degree
- Mould can jeopardize the service life of a building
- Some moulds are harmful/dangerous
- There needs to be a plan for addressing mould
- Remedial action can be very costly
- A significant mould problem can close a facility

To begin addressing these challenges, the participants suggested developing an accreditation program for practitioners at all levels and educating the medical community on the health effects of mould. They also saw opportunities to increase the knowledge base through research in the following areas:

- Moisture management in buildings
- The impact, compatibility and integration of "green" solutions with current design practices and building systems
- Improved methodologies for detecting mould in buildings
- Identification of environmental conditions favourable to mould growth

HIP is a not-for-profit organization that brings together private, public and other not-for-profit organizations and individuals to collaborate on common indoor environmental health issues in Canada. This collaboration focuses on these areas:

- Consolidation and integration of research
- Promotion of guidelines and best practices
- Fostering of related programs in marketing, and education and outreach.

In addition, the group provides a source of indoor environment information and resources, maintains a list of workshops and other events, and publishes a free newsletter to help members and supporters stay up to date on indoor environmental issues in Canada.

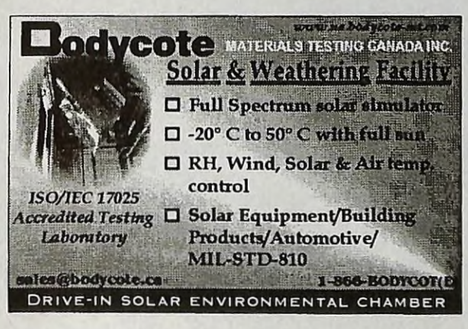
Based on the success of this inaugural mould workshop, organizers are tentatively planning a second one for October 2005. In addition, HIP is exploring the possibility of collaborative projects among HIP partners and other stakeholders for addressing the issues identified at the workshop.

The Healthy Indoors Partnership

The Healthy Indoors Partnership (HIP) is a not-for-profit organization that brings together private, public and not-for-profit organizations and individuals to collaborate on common indoor environmental health issues in Canada. The group provides a source of indoor environment information and resources, maintains a list of conferences and other events, and puts out a free newsletter to help members and supporters stay up to date on indoor environmental issues in Canada. For more information, visit the HIP Web site at *http://www.healthyindoors.com.*

This article was contributed by the National Research Council's Institute for Research in Construction (IRC). IRC is a corporate member of the Healthy Indoors Partnership and brings to the group its significant research expertise in both building envelopes and indoor air quality.

National Research Council Canada | Conseil national de recherches Canada



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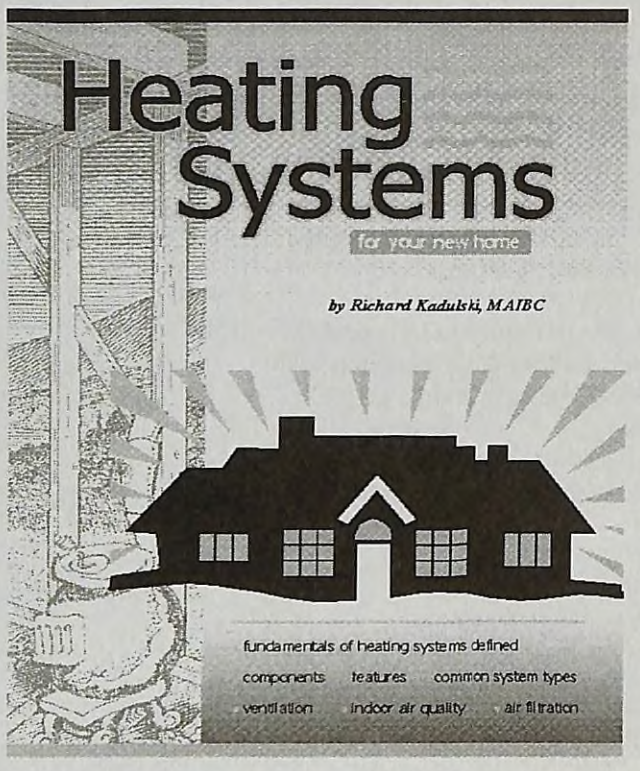

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